

PROJECT MEMORANDUM

FILE COPY

DATE: December 8, 1992
TO: Joe Depner, Hydrogeologist
FROM: Nels Cone, Chemist
SUBJECT: DATA VALIDATION OF ANALYTICAL RESULTS FROM PIER 91 RCRA FACILITY INVESTIGATION, PROJECT 624878, DATA SET #4

On September 22, 1992, soil samples were collected by Burlington Environmental Inc. (Burlington). These samples were submitted to Sound Analytical Services of Tacoma, Washington for semivolatile compound (EPA SW-846 Method 8270) and Total Petroleum Hydrocarbon (EPA SW-846 Methods 418.1 and 8015) analyses. I performed a review of the analytical results on the samples CP-HA-5-4.5-5 and CP-HA-5-6-6.5.

Properly completed chain-of-custody forms were included, along with documented signatures from field to laboratory receipt. The samples were shown as having been properly iced and received in good condition. Holding times were clearly written and evaluated according to regulatory protocol (*National Functional Guidelines for Organic Data Review*, USEPA, 1990). The samples received the requested analyses, and laboratory extraction/analysis times met the established guidelines.

Duplicate analyses were performed as required by the Quality Assurance Project Plan (QAPP). Relative percent differences between individual results indicate detection comparability, although not all met within required quality control (QC) guidelines. Method blank analyses displayed surrogate recoveries well within required QC limits.

Analytical results indicate elevated levels of hydrocarbon compounds requiring dilution in all samples tested. As a result, elevated detection limits were reported, and sample surrogate recoveries were outside normal QC limits, as were recoveries for matrix spike/matrix spike duplicate analyses. The samples were diluted to ensure that target analytes were within the instrument calibration range with the exception of total petroleum fuel hydrocarbons analyses (Method 8015); the contaminating hydrocarbons were not identified as matching the elution pattern for any single product, and the sample concentration clearly exceeded the calibration range. Also as a result of the required dilution, results from semivolatile analyses were found to be below the practical quantitation limits for all detected compounds. Regardless, the data quality objectives as defined in Table F-2 of the QAPP are met.

Supporting documentation for these analyses included instrument calibration/tuning data, and chromatographic/mass spectral data. Data consistency was demonstrated throughout. Proper data qualifier flags accompanied the analytical results as needed, and their use is consistent with USEPA guidelines. Accordingly, this data set can be considered valid for its intended use.

NC/rlk/b42:1939b.mem

SOUND ANALYTICAL SERVICES, INC.

SPECIALIZING IN INDUSTRIAL & TOXIC WASTE ANALYSIS

4813 PACIFIC HIGHWAY EAST, TACOMA, WASHINGTON 98424 - TELEPHONE (206) 922-2310 - FAX (206) 922-5047

17 November, 1992

To: Burlington Environmental Engineering

PROJECT NUMBER: 624878

PROJECT NAME: Pier 91

LABORATORY WORK ORDER NUMBER IDENTIFICATION: 27308

Samples were taken on 9/22/92, and received at Sound Analytical on 9/23/92. The samples were analyzed for semivolatile organics using EPA 8270, total petroleum hydrocarbons by EPA 418.1 modified, and total petroleum hydrocarbons utilizing EPA 8015 modified.

SEMIVOLATILE ORGANICS-

Samples 27308-1, and -2 were analyzed for semivolatile organics by EPA 8270. All samples underwent GPC cleanup. Samples were extracted and analyzed within holding times. Surrogate recoveries for -1 and -2 were outside quality control limits due to matrix interferences requiring dilution of the sample. No target analyte was detected in the method blank above PQL. The percent recoveries for all compounds were outside QC limits except for Pyrene. The spike added was diluted out during analysis. The relative percent difference values for Phenanthrene exceeded QC limits. Due to high concentrations of matrix interferents (TPH) requiring dilution, all target compound levels were below the PQL's.

TOTAL PETROLEUM HYDROCARBONS-

Samples -1 and -2 were extracted and analyzed for Total Petroleum Hydrocarbons using EPA method 418.1 modified for soils on 9/28/92. No detectable contamination was detected in the method blank. The percent recovery of the matrix spike and matrix spike duplicate analysis was outside QC limits due to sample dilution. The relative percent difference was within limits for duplicate analysis. All other quality control parameters were within limits.

TOTAL PETROLEUM FUEL HYDROCARBONS-

Samples -1 and -2 were analyzed for Total Petroleum Fuel Hydrocarbons using EPA method 8015 modified. Samples were extracted on 9/29/92, and analyzed on 10/7/92. The concentration of contaminant found in samples 1- and -2 exceeded the calibration range of the method, and should be considered estimated quantities. The product found encompassed the gasoline, diesel and heavier range organics,

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and was flagged as not matching elution patterns for any single product. Relative percent difference for duplicate analysis exceeded quality control limits, and was re-run with similar results. The percent recoveries for matrix spike and matrix spike duplicates was outside quality control limits due to sample dilution prior to analysis. No contaminant was detected in the method blank, and all other quality control parameters were within limits.

Results were reported dry weight corrected.

No blank correction was used.

Data qualifier flags are included in the quality control package.

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SPECIALIZING IN INDUSTRIAL & TOXIC WASTE ANALYSIS

4813 PACIFIC HIGHWAY EAST, TACOMA, WASHINGTON 98424 - TELEPHONE (206)922-2310 - FAX (206)922-5047

Report To: Burlington Environmental
Engineering

Date: October 12, 1992

Report On: Analysis of Soil

Lab No.: 27308

Page 1 of 8

IDENTIFICATION:

Samples Received on 09-23-92

Project: 624878 Pier 91

ANALYSIS:

Lab No. 27308-1

Client ID: CP-HA5-4.5-5

Semivolatiles Organics Per EPA SW-846 Method 8270

Date Extracted: 9-25-92

Date Analyzed: 10-6-92

CAS No.	Compounds	Concentration ug/kg	PQL	Flags
108-95-2	Phenol	ND	35,000	
111-44-4	bis(2-Chloroethyl) ether	ND	35,000	
95-57-8	2-Chlorophenol	ND	35,000	
541-73-1	1,3-Dichlorobenzene	ND	35,000	
106-46-7	1,4-Dichlorobenzene	ND	35,000	
100-51-6	Benzyl Alcohol	ND	71,000	
95-50-1	1,2-Dichlorobenzene	ND	35,000	
95-48-7	2-Methylphenol	ND	35,000	
39638-32-9	bis(2-Chloroisopropyl) ether	ND	35,000	
106-44-5	4-Methylphenol	ND	35,000	
621-64-7	N-Nitroso-Di-N-propylamine	ND	35,000	
67-72-1	Hexachloroethane	ND	35,000	
98-95-3	Nitrobenzene	ND	35,000	
78-59-1	Isophorone	ND	35,000	
88-75-5	2-Nitrophenol	ND	35,000	
105-67-9	2,4-Dimethylphenol	ND	35,000	
65-85-0	Benzoic Acid	ND	180,000	
111-91-1	bis(2-Chloroethoxy) methane	ND	35,000	
120-83-2	2,4-Dichlorophenol	ND	35,000	
120-82-1	1,2,4-Trichlorobenzene	ND	35,000	
91-20-3	Naphthalene	8,400	35,000	J
106-47-8	4-Chloroaniline	ND	71,000	
87-68-3	Hexachlorobutadiene	ND	35,000	
59-50-7	4-Chloro-3-methylphenol	ND	71,000	

ND - Not Detected

Continued

SOUND ANALYTICAL SERVICES, INC.

Burlington Environmental, Engineering
 Project: 624878
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 Lab No. 27308
 October 12, 1992

Lab No. 27308-1

Client ID: CP-HA5-4.5-5

EPA Method 8270 Continued

CAS No.	Compounds	Concentration ug/kg	PQL	Flags
91-57-6	2-Methylnaphthalene	23,000	35,000	J
77-47-4	Hexachlorocyclopentadiene	ND	35,000	
88-06-2	2,4,6-Trichlorophenol	ND	35,000	
95-95-4	2,4,5-Trichlorophenol	ND	35,000	
91-58-7	2-Chloronaphthalene	ND	35,000	
88-74-4	2-Nitroaniline	ND	180,000	
131-11-3	Dimethyl phthalate	ND	35,000	
208-96-8	Acenaphthylene	ND	35,000	
606-20-2	2,6-Dinitrotoluene	ND	35,000	
99-09-2	3-Nitroaniline	ND	180,000	
83-32-9	Acenaphthene	ND	35,000	
51-28-5	2,4-Dinitrophenol	ND	180,000	
100-02-7	4-Nitrophenol	ND	180,000	
132-64-9	Dibenzofuran	ND	35,000	
121-14-2	2,4-Dinitrotoluene	ND	35,000	
84-66-2	Diethylphthalate	ND	35,000	
7005-72-3	4-Chlorophenyl phenyl ether	ND	35,000	
86-73-7	Fluorene	4,500	35,000	J
100-01-6	4-Nitroaniline	ND	180,000	
534-52-1	4,6-Dinitro-2-methylphenol	ND	180,000	
86-30-6	N-Nitrosodiphenylamine	ND	35,000	
101-55-3	4-Bromophenyl phenyl ether	ND	35,000	
118-74-1	Hexachlorobenzene	ND	35,000	
87-86-5	Pentachlorophenol	ND	180,000	
85-01-8	Phenanthrene	3,500	35,000	J
120-12-7	Anthracene	ND	35,000	
84-74-2	Di-n-butylphthalate	ND	35,000	

ND - Not Detected

Continued

SOUND ANALYTICAL SERVICES, INC.

Burlington Environmental, Engineering
 Project: 624878
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 Lab No. 27308
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Lab No. 27308-1

Client ID: CP-HA5-4.5-5

EPA Method 8270 Continued

CAS No.	Compounds	Concentration ug/kg	PQL	Flags
206-44-0	Fluoranthene	ND	35,000	J
129-00-0	Pyrene	5,200	35,000	
85-68-7	Butyl benzyl phthalate	ND	35,000	
91-94-1	3,3'-Dichlorobenzidine	ND	71,000	
56-55-3	Benzo(a)anthracene	ND	35,000	
218-01-9	Chrysene	ND	35,000	
117-81-7	bis(2-ethylhexyl)phthalate	ND	35,000	
117-84-0	Di-n-octyl phthalate	ND	35,000	
205-99-2	Benzo(b)fluoranthene	ND	35,000	
207-08-9	Benzo(k)fluoranthene	ND	35,000	
50-32-8	Benzo(a)pyrene	ND	35,000	
193-39-5	Indeno(1,2,3-cd)pyrene	ND	35,000	
53-70-3	Dibenz(a,h)anthracene	ND	35,000	
191-24-2	Benzo(g,h,i)perylene	ND	35,000	

ND - Not Detected

PQL - Practical Quantitation Limit - These are the quantitation limits for this sample. This number is based on sample size, matrix and dilution required.

Results are reported on a dry weight basis.

Semi-Volatile Surrogates

Surrogate Compound	Percent Recovery	Control Limits	
		Water	Soil
Nitrobenzene - d ₅	X8	35 - 114	23 - 120
2-Fluorobiphenyl	X8	43 - 116	30 - 115
p-Terphenyl-d ₁₄	X8	33 - 141	18 - 137
Phenol-d ₆	X8	10 - 94	24 - 113
2-Fluorophenol	X8	21 - 100	25 - 121
2,4,6-Tribromophenol	X8	10 - 123	19 - 122

Continued

SOUND ANALYTICAL SERVICES, INC.

Burlington Environmental, Engineering
Project: 624878
Page 4 of 8
Lab No. 27308
October 12, 1992

Lab No. 27308-1

Client ID: CP-HA5-4.5-5

TPH Per EPA Method 418.1
Date Extracted: 9-28-92
Date Analyzed: 9-28-92

Total Petroleum
Hydrocarbons, mg/kg 35,000

TPH Per EPA SW-846 Modified Method 8015
Date Extracted: 9-29-92
Date Analyzed: 10-7-92

Total Petroleum
Fuel Hydrocarbons, mg/kg 55,000 E, X2

TPH as Aged Gasoline, Diesel, Heavy Oil

SURROGATE RECOVERY, %
1-chlorooctane X8
o-terphenyl X8

*didn't get
return
because
physical
dilution method
introduces error
resulting in
decreased
accuracy*

Continued

SOUND ANALYTICAL SERVICES, INC.

Burlington Environmental, Engineering
 Project: 624878
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 Lab No. 27308
 October 12, 1992

Lab No. 27308-2

Client ID: CP-HA5-6-6.5

Semivolatile Organics Per EPA SW-846 Method 8270

Date Extracted: 9-25-92

Date Analyzed: 10-6-92

CAS No.	Compounds	Concentration ug/kg	PQL	Flags
108-95-2	Phenol	ND	8,000	
111-44-4	bis(2-Chloroethyl) ether	ND	8,000	
95-57-8	2-Chlorophenol	ND	8,000	
541-73-1	1,3-Dichlorobenzene	ND	8,000	
106-46-7	1,4-Dichlorobenzene	ND	8,000	
100-51-6	Benzyl Alcohol	ND	16,000	
95-50-1	1,2-Dichlorobenzene	ND	8,000	
95-48-7	2-Methylphenol	ND	8,000	
39638-32-9	bis(2-Chloroisopropyl) ether	ND	8,000	
106-44-5	4-Methylphenol	ND	8,000	
621-64-7	N-Nitroso-Di-N-propylamine	ND	8,000	
67-72-1	Hexachloroethane	ND	8,000	
98-95-3	Nitrobenzene	ND	8,000	
78-59-1	Isophorone	ND	8,000	
88-75-5	2-Nitrophenol	ND	8,000	
105-67-9	2,4-Dimethylphenol	ND	8,000	
65-85-0	Benzoic Acid	ND	40,000	
111-91-1	bis(2-Chloroethoxy) methane	ND	8,000	
120-83-2	2,4-Dichlorophenol	ND	8,000	
120-82-1	1,2,4-Trichlorobenzene	ND	8,000	
91-20-3	Naphthalene	2,300	8,000	J
106-47-8	4-Chloroaniline	ND	16,000	
87-68-3	Hexachlorobutadiene	ND	8,000	
59-50-7	4-Chloro-3-methylphenol	ND	16,000	

ND - Not Detected

Continued

SOUND ANALYTICAL SERVICES, INC.

Burlington Environmental, Engineering
 Project: 624878
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 Lab No. 27308
 October 12, 1992

Lab No. 27308-2

Client ID: CP-HA5-6-6.5

EPA Method 8270 Continued

CAS No.	Compounds	Concentration ug/kg	PQL	Flags
91-57-6	2-Methylnaphthalene	5,700	8,000	J
77-47-4	Hexachlorocyclopentadiene	ND	8,000	
88-06-2	2,4,6-Trichlorophenol	ND	8,000	
95-95-4	2,4,5-Trichlorophenol	ND	8,000	
91-58-7	2-Chloronaphthalene	ND	8,000	
88-74-4	2-Nitroaniline	ND	40,000	
131-11-3	Dimethyl phthalate	ND	8,000	
208-96-8	Acenaphthylene	ND	8,000	
606-20-2	2,6-Dinitrotoluene	ND	8,000	
99-09-2	3-Nitroaniline	ND	40,000	
83-32-9	Acenaphthene	940	8,000	J
51-28-5	2,4-Dinitrophenol	ND	40,000	
100-02-7	4-Nitrophenol	ND	40,000	
132-64-9	Dibenzofuran	ND	8,000	
121-14-2	2,4-Dinitrotoluene	ND	8,000	
84-66-2	Diethylphthalate	ND	8,000	
7005-72-3	4-Chlorophenyl phenyl ether	ND	8,000	
86-73-7	Fluorene	1,300	8,000	J
100-01-6	4-Nitroaniline	ND	40,000	
534-52-1	4,6-Dinitro-2-methylphenol	ND	40,000	
86-30-6	N-Nitrosodiphenylamine	ND	8,000	
101-55-3	4-Bromophenyl phenyl ether	ND	8,000	
118-74-1	Hexachlorobenzene	ND	8,000	
87-86-5	Pentachlorophenol	ND	40,000	
85-01-8	Phenanthrene	2,300	8,000	J
120-12-7	Anthracene	ND	8,000	
84-74-2	Di-n-butylphthalate	ND	8,000	

ND - Not Detected

Continued

SOUND ANALYTICAL SERVICES, INC.

Burlington Environmental, Engineering
 Project: 624878
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 Lab No. 27308
 October 12, 1992

Lab No. 27308-2

Client ID: CP-HA5-6-6.5

EPA Method 8270 Continued

CAS No.	Compounds	Concentration ug/kg	PQL	Flags
206-44-0	Fluoranthene	ND	8,000	J
129-00-0	Pyrene	880	8,000	
85-68-7	Butyl benzyl phthalate	ND	8,000	
91-94-1	3,3'-Dichlorobenzidine	ND	16,000	
56-55-3	Benzo(a)anthracene	ND	8,000	
218-01-9	Chrysene	ND	8,000	
117-81-7	bis(2-ethylhexyl)phthalate	ND	8,000	
117-84-0	Di-n-octyl phthalate	ND	8,000	
205-99-2	Benzo(b)fluoranthene	ND	8,000	
207-08-9	Benzo(k)fluoranthene	ND	8,000	
50-32-8	Benzo(a)pyrene	ND	8,000	
193-39-5	Indeno(1,2,3-cd)pyrene	ND	8,000	
53-70-3	Dibenz(a,h)anthracene	ND	8,000	
191-24-2	Benzo(g,h,i)perylene	ND	8,000	

ND - Not Detected

PQL - Practical Quantitation Limit - These are the quantitation limits for this sample. This number is based on sample size, matrix and dilution required.

Results are reported on a dry weight basis.

Semi-Volatile Surrogates

Surrogate Compound	Percent Recovery	Control Limits	
		Water	Soil
Nitrobenzene - d ₅	X8	35 - 114	23 - 120
2-Fluorobiphenyl	X8	43 - 116	30 - 115
p-Terphenyl-d ₁₄	X8	33 - 141	18 - 137
Phenol-d ₆	X8	10 - 94	24 - 113
2-Fluorophenol	X8	21 - 100	25 - 121
2,4,6-Tribromophenol	X8	10 - 123	19 - 122

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SOUND ANALYTICAL SERVICES, INC.

Burlington Environmental, Engineering
Project: 624878
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Lab No. 27308
October 12, 1992

Lab No. 27308-2

Client ID: CP-HA5-6-6.5

TPH Per EPA Method 418.1
Date Extracted: 9-28-92
Date Analyzed: 9-28-92

Total Petroleum
Hydrocarbons, mg/kg 15,000

TPH Per EPA SW-846 Modified Method 8015
Date Extracted: 9-29-92
Date Analyzed: 10-7-92

Total Petroleum
Fuel Hydrocarbons, mg/kg 20,000 E

TPH as Aged Gasoline, Diesel, Heavy Oil

SURROGATE RECOVERY, %

1-chlorooctane	X8
o-terphenyl	X8

SOUND ANALYTICAL SERVICES


DENNIS L. BEAN

SOUND ANALYTICAL SERVICES, INC.

SPECIALIZING IN INDUSTRIAL & TOXIC WASTE ANALYSIS

4813 PACIFIC HIGHWAY EAST, TACOMA, WASHINGTON 98424 - TELEPHONE (206)922-2310 - FAX (206)922-5047

QUALITY CONTROL REPORT

SEMIVOLATILE ORGANICS PER EPA SW-846 METHOD 8270

Page 1 of 3

Client: Burlington Environmental, Engineering
Lab No: 27308qc3
Units: ug/kg
Date: October 12, 1992
Blank No: S6287

METHOD BLANK

Compound	Blank Value	PQL	Flags
Phenol	ND	670	
bis(2-Chloroethyl) ether	ND	670	
2-Chlorophenol	ND	670	
1,3-Dichlorobenzene	ND	670	
1,4-Dichlorobenzene	ND	670	
Benzyl Alcohol	ND	1,300	
1,2-Dichlorobenzene	ND	670	
2-Methylphenol	ND	670	
bis(2-Chloroisopropyl) ether	ND	670	
4-Methylphenol	ND	670	
N-Nitroso-Di-N-propylamine	ND	670	
Hexachloroethane	ND	670	
Nitrobenzene	ND	670	
Isophorone	ND	670	
2-Nitrophenol	ND	670	
2,4-Dimethylphenol	ND	670	
Benzoic Acid	ND	3,300	
bis(2-Chloroethoxy)methane	ND	670	
2,4-Dichlorophenol	ND	670	
1,2,4-Trichlorobenzene	ND	670	
Naphthalene	ND	670	
4-Chloroaniline	ND	1,300	
Hexachlorobutadiene	ND	670	
4-Chloro-3-methylphenol	ND	1,300	
2-Methylnaphthalene	ND	670	
Hexachlorocyclopentadiene	ND	670	
2,4,6-Trichlorophenol	ND	670	
2,4,5-Trichlorophenol	ND	670	
2-Chloronaphthalene	ND	670	
2-Nitroaniline	ND	3,300	
Dimethyl phthalate	ND	670	
Acenaphthylene	ND	670	

Continued

SOUND ANALYTICAL SERVICES, INC.

SEMIVOLATILE ORGANICS PER EPA SW-846 METHOD 8270

Page 2 of 3

Client: Burlington Environmental, Engineering
 Lab No: 27308qc3
 Units: ug/kg
 Date: October 12, 1992
 Blank No: S6287

METHOD BLANK

Compound	Blank Value	PQL	Flags
3-Nitroaniline	ND	3,300	
Acenaphthene	ND	670	
2,4-Dinitrophenol	ND	3,300	
4-Nitrophenol	ND	3,300	
Dibenzofuran	ND	670	
2,4-Dinitrotoluene	ND	670	
2,4-Dinitrotoluene	ND	670	
2,6-Dinitrotoluene	ND	670	
Diethylphthalate	ND	670	
4-Chlorophenyl phenyl ether	ND	670	
Fluorene	ND	670	
4-Nitroaniline	ND	3,300	
4,6-Dinitro-2-methylphenol	ND	3,300	
N-Nitrosodiphenylamine	ND	670	
4-Bromophenyl phenyl ether	ND	670	
Hexachlorobenzene	ND	670	
Pentachlorophenol	ND	3,300	
Phenanthrene	ND	670	
Anthracene	ND	670	
Di-n-butylphthalate	220	670	J
Fluoranthene	ND	670	
Pyrene	ND	670	
Butyl benzyl phthalate	ND	670	
3,3'-Dichlorobenzidine	ND	1,300	
Benzo(a)anthracene	ND	670	
bis(2-ethylhexyl)phthalate	ND	670	
Chrysene	ND	670	
Di-n-octyl phthalate	ND	670	
Benzo(b)fluoranthene	ND	670	
Benzo(k)fluoranthene	ND	670	
Benzo(a)pyrene	ND	670	
Indeno(1,2,3-cd)pyrene	ND	670	
Dibenz(a,h)anthracene	ND	670	
Benzo(g,h,i)perylene	ND	670	

Continued.

SOUND ANALYTICAL SERVICES, INC.

QUALITY CONTROL REPORT

SEMIVOLATILE ORGANICS PER EPA SW-846 METHOD 8270

Page 3 of 3

Client: Burlington Environmental, Engineering
Lab No: 27308qc3
Units: ug/kg
Date: October 12, 1992
Blank No: S6287

ND = Not Detected.

PQL = Practical Quantitation Limit - These are the quantitation limits for this sample. This number is based on sample size, matrix and dilution required.

SEMIVOLATILE SURROGATES

Surrogate	Percent Recovery	Control Limits	
		Water	Soil
Nitrobenzene - d5	86	35 - 114	23 - 120
2-Fluorobiphenyl	85	43 - 116	30 - 115
p-Terphenyl-d14	95	33 - 141	18 - 137
Phenol-d6	73	10 - 94	24 - 113
2-Fluorophenol	88	21 - 100	25 - 121
2,4,6-TBP	93	10 - 123	19 - 122

SOUND ANALYTICAL SERVICES, INC.

SPECIALIZING IN INDUSTRIAL & TOXIC WASTE ANALYSIS

4813 PACIFIC HIGHWAY EAST, TACOMA, WASHINGTON 98424 - TELEPHONE (206)922-2310 - FAX (206)922-5047

QUALITY CONTROL REPORT

SEMIVOLATILE ORGANICS PER EPA SW-846 METHOD 8270

Page 1 of 3

Client: Burlington Environmental, Engineering
Lab No: 27308qc4
Matrix: Soil
Units: ug/kg
Date: October 12, 1992
Dup No: 27308-1

DUPLICATE

CPHA-5-415.5

Compound	Sample (S)	Duplicate (D)	RPD	FLAGS
Phenol	ND	ND	0.0	
bis(2-Chloroethyl) ether	ND	ND	0.0	
2-Chlorophenol	ND	ND	0.0	
1,3-Dichlorobenzene	ND	ND	0.0	
1,4-Dichlorobenzene	ND	ND	0.0	
Benzyl Alcohol	ND	ND	0.0	
1,2-Dichlorobenzene	ND	ND	0.0	
2-Methylphenol	ND	ND	0.0	
bis(2-Chloroisopropyl)ether	ND	ND	0.0	
4-Methylphenol	ND	ND	0.0	
N-Nitroso-Di-N-propylamine	ND	ND	0.0	
Hexachloroethane	ND	ND	0.0	
Nitrobenzene	ND	ND	0.0	
Isophorone	ND	ND	0.0	
2-Nitrophenol	ND	ND	0.0	
2,4-Dimethylphenol	ND	ND	0.0	
Benzoic Acid	ND	ND	0.0	
bis(2-Chloroethoxy)methane	ND	ND	0.0	
2,4-Dichlorophenol	ND	ND	0.0	
1,2,4-Trichlorobenzene	ND	ND	0.0	
Naphthalene	8,400	11,000	27.0	J
4-Chloroaniline	ND	ND	0.0	
Hexachlorobutadiene	ND	ND	0.0	
4-Chloro-3-methylphenol	ND	ND	0.0	
2-Methylnaphthalene	23,000	28,000	20.0	J
Hexachlorocyclopentadiene	ND	ND	0.0	
2,4,6-Trichlorophenol	ND	ND	0.0	
2,4,5-Trichlorophenol	ND	ND	0.0	
2-Chloronaphthalene	ND	ND	0.0	
2-Nitroaniline	ND	ND	0.0	
Dimethyl phthalate	ND	ND	0.0	

Continued

SOUND ANALYTICAL SERVICES, INC.

QUALITY CONTROL REPORT

SEMIVOLATILE ORGANICS PER EPA SW-846 METHOD 8270

Page 2 of 3

Client: Burlington Environmental, Engineering
 Lab No: 27308qc4
 Matrix: Soil
 Units: ug/kg
 Date: October 12, 1992
 Dup No: 27308-1

CP-HA-5-4,5-5

DUPLICATE

Compound	Sample (S)	Duplicate (D)	RPD	FLAGS
Acenaphthylene	ND	ND	0.0	
3-Nitroaniline	ND	ND	0.0	
Acenaphthene	ND	ND	0.0	
2,4-Dinitrophenol	ND	ND	0.0	
4-Nitrophenol	ND	ND	0.0	
Dibenzofuran	ND	ND	0.0	
2,4-Dinitrotoluene	ND	ND	0.0	
2,6-Dinitrotoluene	ND	ND	0.0	
Diethylphthalate	ND	ND	0.0	
4-Chlorophenyl phenyl ether	ND	ND	0.0	
Fluorene	4,500	5,600	22.0	J
4-Nitroaniline	ND	ND	0.0	
4,6-Dinitro-2-methylphenol	ND	ND	0.0	
N-Nitrosodiphenylamine	ND	ND	0.0	
4-Bromophenyl phenyl ether	ND	ND	0.0	
Hexachlorobenzene	ND	ND	0.0	
Pentachlorophenol	ND	ND	0.0	
Phenanthrene	3,500	14,000	120.0	J
Anthracene	ND	ND	0.0	
Di-n-butylphthalate	ND	ND	0.0	
Fluoranthene	ND	ND	0.0	
Pyrene	5,200	4,500	14.0	J
Butyl benzyl phthalate	ND	ND	0.0	
3,3'-Dichlorobenzidine	ND	ND	0.0	
Benzo(a)anthracene	ND	ND	0.0	
bis(2-ethylhexyl)phthalate	ND	ND	0.0	
Chrysene	ND	ND	0.0	
Di-n-octyl phthalate	ND	ND	0.0	
Benzo(b)fluoranthene	ND	ND	0.0	
Benzo(k)fluoranthene	ND	ND	0.0	
Benzo(a)pyrene	ND	ND	0.0	
Indeno(1,2,3-cd)pyrene	ND	ND	0.0	
Dibenz(a,h)anthracene	ND	ND	0.0	
Benzo(g,h,i)perylene	ND	ND	0.0	

Continued

SOUND ANALYTICAL SERVICES, INC.

QUALITY CONTROL REPORT

SEMIVOLATILE ORGANICS PER EPA SW-846 METHOD 8270

Page 3 of 3

Client: Burlington Environmental, Engineering
Lab No: 27308qc4
Matrix: Soil
Units: ug/kg
Date: October 12, 1992
Dup No: 27308-1

DUPLICATE

ND = Not Detected

RPD = Relative Percent Difference
= $[(S - D) / ((S + D) / 2)] \times 100$

SEMIVOLATILE SURROGATES

Surrogate	Sample	Duplicate	Control Limits	
			Water	Soil
Nitrobenzene - d5	X8	X8	35 - 114	23 - 120
2-Fluorobiphenyl	X8	X8	43 - 116	30 - 115
p-Terphenyl-d14	X8	X8	33 - 141	18 - 137
Phenol-d6	X8	X8	10 - 94	24 - 113
2-Fluorophenol	X8	X8	21 - 100	25 - 121
2,4,6-TBP	X8	X8	10 - 123	19 - 122

SOUND ANALYTICAL SERVICES, INC.

SPECIALIZING IN INDUSTRIAL & TOXIC WASTE ANALYSIS

4813 PACIFIC HIGHWAY EAST, TACOMA, WASHINGTON 98424 - TELEPHONE (206) 922-2310 - FAX (206) 922-5047

SOIL MATRIX SPIKE / MATRIX SPIKE DUPLICATE RECOVERY

Client Name: Burlington Environmental, Engineering
Lab No: 27308qc5
Date: October 12, 1992

SEMI-VOLATILE ORGANICS

COMPOUND	SPIKE (ug/kg)	SAMPLE RESULT	CONC MS	% REC	CONC MSD	% REC	RPD	Flags
1,2,4-Trichlorobenzene	3,500	ND	ND	0.0	ND	0.0	0.0	X5
Acenaphthene	3,500	ND	6,400	181	6,100	173	4.5	X5
2,4 Dinitrotoluene	3,500	ND	ND	0.0	ND	0.0	0.0	X5
Pyrene	3,500	5,200	7,300	60	6,900	49	20	X5
N-nitrosodi-n-Propylamine	3,500	ND	ND	0.0	ND	0.0	0.0	X5
1,4-Dichlorobenzene	3,500	ND	ND	0.0	ND	0.0	0.0	X5
Pentachlorophenol	3,500	ND	ND	0.0	ND	0.0	0.0	X5
Phenol	3,500	ND	ND	0.0	ND	0.0	0.0	X5
2-Chlorophenol	3,500	ND	ND	0.0	ND	0.0	0.0	X5
4-Chloro-3-Methylphenol	3,500	ND	ND	0.0	ND	0.0	0.0	X5
4-Nitrophenol	3,500	ND	ND	0.0	ND	0.0	0.0	X5

RPD = Relative Percent Difference

% REC = Percent Recovery

QC Limits:	Max RPD	% RECOVERY
1,2,4-Trichlorobenzene	23	38-107
Acenaphthene	19	31-137
2,4 Dinitrotoluene	47	28-89
Pyrene	36	35-142
N-nitrosodi-n-Propylamine	38	41-126
1,4-Dichlorobenzene	27	28-104
Pentachlorophenol	47	17-109
Phenol	35	26-90
2-Chlorophenol	50	25-102
4-Chloro-3-Methylphenol	33	26-103
4-Nitrophenol	50	11-114

* These are advisory limits only.

SOUND ANALYTICAL SERVICES, INC.

SPECIALIZING IN INDUSTRIAL & TOXIC WASTE ANALYSIS

4813 PACIFIC HIGHWAY EAST, TACOMA, WASHINGTON 98424 - TELEPHONE (206) 922-2310 - FAX (206) 922-5047

QUALITY CONTROL REPORT

Total Petroleum Fuel Hydrocarbons by Method 8015

Page 1 of 2

Client: Burlington Environmental, Engineering
Lab No: 27308qc6
Matrix: Soil
Units: mg/kg
Date: November 12, 1992

DUPLICATE

Dup. No. 27308-1

Parameter	Sample(S)	Duplicate(D)	RPD	Flags
Total Petroleum Fuel Hydrocarbons	55,000	40,000	31	X4
<u>SURROGATE RECOVERY%</u> 1-chlorooctane o-terphenyl				X8 X8

outside QC limits

surrogate detected out

RPD = relative percent difference
$$= [(S - D) / ((S + D) / 2)] \times 100$$

MATRIX SPIKE / MATRIX SPIKE DUPLICATE RECOVERY

MSD No.

spike detected out

Parameter	Sample Result (SR)	Spiked Sample Result (MS)	Spike Added (SA)	%R	Spike Dup Result (MSD)	RPD
Total Petroleum Fuel Hydrocarbons	55,000	29,000	405	X5	30,000	3.4
<u>SURROGATE RECOVERY%</u> 1-chlorooctane o-terphenyl						X8 X8

%R = Percent Recovery
$$= [(MS - SR) / SA] \times 100$$

RPD = Relative Percent Difference
$$= [(MS - MSD) / ((MS + MSD) / 2)] \times 100$$

SOUND ANALYTICAL SERVICES, INC.

QUALITY CONTROL REPORT

Total Petroleum Fuel Hydrocarbons by Method 8015

Page 2 of 2

Client: Burlington Environmental, Engineering
Lab No: 27308qc6
Units: mg/kg
Date: November 12, 1992

METHOD BLANK

Blank No.

Parameter	Blank Value
Total Petroleum Fuel Hydrocarbons	< 10
<u>SURROGATE RECOVERY</u> 1-chlorooctane	85
o-terphenyl	69

SOUND ANALYTICAL SERVICES, INC.

SPECIALIZING IN INDUSTRIAL & TOXIC WASTE ANALYSIS

4813 PACIFIC HIGHWAY EAST, TACOMA, WASHINGTON 98424 - TELEPHONE (206) 922-2310 - FAX (206) 922-5047

QUALITY CONTROL REPORT

TPH by Method 418.1

Client: Burlington Environmental, Engineering
Lab No: 27308qc1
Matrix: Soil
Units: mg/kg
Date: October 12, 1992

DUPLICATE

Dup No. 27308-1

Parameter	Sample(S)	Duplicate(D)	RPD
Total Petroleum Hydrocarbons	35,000	34,000	2.9

RPD = Relative Percent Difference
= $[(S - D) / ((S + D) / 2)] \times 100$

MATRIX SPIKE / MATRIX SPIKE DUPLICATE RECOVERY

MSD No. 27308-1

Parameter	Sample Result (SR)	Spiked Sample Result (MS)	Spike Added (SA)	%R	Spike Dup Result (MSD)	RPD
Total Petroleum Hydrocarbons	35,000	33,000	880	X5	38,000	14.1

%R = Percent Recovery
= $[(MS - SR) / SA] \times 100$

RPD = Relative Percent Difference
= $[(MS - MSD) / ((MS + MSD) / 2)] \times 100$

METHOD BLANK

Parameter	Blank Value
Total Petroleum Hydrocarbons	< 10

SOUND ANALYTICAL SERVICES, INC.

SPECIALIZING IN INDUSTRIAL & TOXIC WASTE ANALYSIS

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DATA QUALIFIER FLAGS

- ND: Indicates that the analyte was analyzed for but was not detected. The associated numerical value is the practical quantitation limit, corrected for sample dilution.
- J: The analyte was analyzed for and positively identified, but the associated numerical value is an estimated quantity.
- C: The identification of this analyte was confirmed by GC/MS.
- B: This analyte was also detected in the associated method blank. There is a possibility of blank contamination.
- E: The concentration of this analyte exceeded the instrument calibration range.
- D: The reported result for this analyte is calculated based on a secondary dilution factor.
- A: This TIC is a suspected aldol-condensation product.
- M: Quantitation Limits are elevated due to matrix interferences.
- S: The calibration quality control criteria for this compound were not met. The reported concentration should be considered an estimated quantity.
- X1: Contaminant does not appear to be "typical" product. Elution pattern suggests it may be _____.
- X2: Contaminant does not appear to be "typical" product. Further testing is suggested for identification.
- X3: Identification and quantification of peaks was complicated by matrix interference; GC/MS confirmation is recommended.
- X4: RPD for duplicates outside QC limits. Sample was re-analyzed with similar results. Sample matrix is nonhomogeneous.
- X4a: RPD for duplicates outside QC limits due to analyte concentration near the method practical quantitation limit/detection limit.
- X5: Matrix spike was diluted out during analysis.
- X6: Recovery of matrix spike outside QC limits. Sample was re-analyzed with similar results.
- X7: Recovery of matrix spike outside QC limits. Matrix interference is indicated by blank spike recovery data.
- X8: Surrogate was diluted out during analysis.
- X9: Surrogate recovery outside QC limits due to matrix composition.
- X10: Surrogate recovery outside QC limits due to high contaminant levels.

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BURLINGTON ENVIRONMENTAL INC.

Set 4

CHAIN OF CUSTODY



**BURLINGTON
ENVIRONMENTAL**

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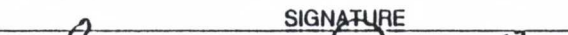



CHAIN-OF-CUSTODY RECORD

C.O.C. SERIAL NO. 6067

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		9-23	10:05			9-23	10:05
		9/23	11:59			9/23/22	11:59
SHIPPING NOTES				LAB NOTES			